

CUSTOMER NO.: 24498
Serial No. 09/786,432
Amendment dated: October 14, 2004
Reply to Office Action of July 28, 2004

PATENT
PF980059

REMARKS

Claims 1-13 are pending in this application with claims 3 – 5 being amended by this response.

Rejection of Claims 3 – 5 under 35 USC § 112

Claims 3 – 5 were rejected under 35 USC 112, second paragraph for the reasons stated in the Office Action.

Claim 3 – 5 were rejected for including limitations that lacked proper antecedent basis. Claims 3 – 5 are amended by this response to provide proper antecedent basis in accordance with 35 USC 112, second paragraph for all terms. In view of the above remarks and amendments to claims 3 – 5, it is respectfully submitted that this rejection has been satisfied and should be withdrawn.

Rejection of Claims 1- 4, 7, 10 and 11 under 35 USC § 103(a)

Claims 1-4, 7, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kerdranvrat in view of Lee.

The present claimed invention recites a method of movement estimation for a sequence of images including segmentation of a current video image into image blocks. Movement estimation occurs per image block in order to obtain a movement vector field for the current image. A vector is reassigned to a block by selecting one movement vector from among N predominant vectors. The predominant vectors are the ones of the group of vectors belonging to the movement vector field of the current image and at least to the movement vector field of a preceding image. The vectors are scaled according to the temporal distance to which they correspond.

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An important and novel step disclosed by the present claimed invention is “a stage of reassignment of a vector to a block by selecting one movement vector from among N predominant vectors, wherein the predominant vectors are the ones of the group of vectors belonging to the movement vector field of said current image and at least to the movement vector field of a preceding image”. This feature is neither disclosed nor suggested by either Kerdranvrat or Lee, either individually or in combination with one another.

Kerdranvrat discloses a method of segmenting the field of motion of an image including forming a blockwise field of motion from motion vectors allocated to image pixels. Dominant vectors of motion are extracted from the blockwise field of vectors after processing thereof. The vectors close to the dominant vectors are eliminated so as to retain only representatives of widened classes of motion. The Examiner cites column 2, lines 9-19 of Kerdranvrat as disclosing the selection of a movement vector from among N predominant vectors is made among the group of vectors belonging to the movement vector field of the current image and at least to the movement vector field of a preceding image. Applicants respectfully disagree with the contention of the Examiner. Kerdranvrat merely discloses a phase of “extraction of a set of dominant vectors from the nxn blockwise field of vectors which already comprises a reduced number of vectors”. This field of vectors is a field of only the current image. Consequently, Kerdranvrat neither discloses nor suggests “a stage of reassignment of a vector to a block by selecting one movement vector from among N predominant vectors, wherein the predominant vectors are the ones of the group of vectors belonging to the movement vector field of said current image and at least to the movement vector field of a preceding image” as in the present claimed invention.

The distinction between the present claimed invention and Kerdranvrat is further made clear when taking into account the “stage of reassignment of a vector to a block by selecting one movement vector from among N predominant vectors” of the present claimed invention. The choice “predominant vectors” of the present claimed invention “are the ones of the group of vectors belonging to the movement vector field

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of said current image and at least to the movement vector field of a preceding image". Thus, by taking into account more than one motion vector field allows not only to get the "spatial" dominant motions in the current image but also the "temporal" dominant motions. This result is due to the temporal filtering obtained by taking into account several images in the sequence. Furthermore, this result is neither disclosed nor suggested by Kerdranvrat.

The choice of "one movement vector from among N predominant vectors" as described above is performed using a histogram. Applicants submit that results of firstly calculating the histogram of the current image and then combining that histogram with the histogram of a previous image, as suggested by Kerdranvrat, is not the same as "a stage of reassignment of a vector to a block by selecting one movement vector from among N predominant vectors, wherein the predominant vectors are the ones of the group of vectors belonging to the movement vector field of said current image and at least to the movement vector field of a preceding image" as in the present claimed invention.

The advantage of the system disclosed in claim 1 of the present invention which utilizes only one histogram for two or more images (an other way to say that we choose predominant motion vectors among vectors belonging to two or more motion vector fields) is to obtain a better coherence between the motion fields of successive images. This is advantageous in MPEG coding as the calculation of backward and forward motion vectors of a B image can be made by taking into account the motion vector field between the P images framing the B image thereby increasing the "signal to noise ratio" of the motion vector fields. Furthermore, coding cost is reduced due to this improvement of coherence because the coding of the motion vectors is a differential coding.

Lee discloses an image encoding scheme in which two or more different sets of motion vectors are generated for each image that is to be encoded using motion estimation. Furthermore, Lee discloses temporal interpolation to "extrapolate" a new motion vector field from one already calculated through a classical estimation. The

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aim of such an extrapolation is to deduce a motion vector field for another image and consequently to simplify motion field calculation and to reduce the processing load. The coding performed by Lee differs from the method of the present invention in that the motion vector field of the current image can be calculated, before merging, independently from the motion vector field of the previous image. Similarly to Kerdranvrat, Lee also neither discloses nor suggests “a stage of reassignment of a vector to a block by selecting one movement vector from among N predominant vectors, wherein the predominant vectors are the ones of the group of vectors belonging to the movement vector field of said current image and at least to the movement vector field of a preceding image” as in the present claimed invention. In fact, there is no suggestion in Lee regarding merging the two motion vector fields as in the present invention.

Applicants further respectfully submit there is no motivation or reason to combine the system disclosed by Kerdranvrat with the coding scheme of Lee. Kerdranvrat is concerned with segmenting the field of motion for a subsequent processing by quad-tree encoding of dominant vectors for transmission after encoding. On the other hand, the system disclosed by Lee is intended to reduce the computational requirements of motion estimation processing. A person skilled in the art of motion estimation would not think to combine the inventions disclosed by Kerdranvrat and Lee to solve the problem remedied in the present claimed invention. Specifically, the combination of Kerdranvrat and Lee does not improve performance by reducing the overhead for the coding of vectors, generally being a differential coding type (see specification, page 1, lines 16 – 22) as is the objective of the present claimed invention. Furthermore, there is no motivation to combine the cited references in order to remedy another intended goal of the present invention which is to provide temporal scaling to match the scales for the merging of the two motion vector fields.

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Additionally, applicants respectfully submit that any system resulting from a combination of Kerdranvrat with Lee would not produce the present claimed invention. Rather, the combination would produce a method of segmenting an image wherein dominant vectors are extracted from a field of vectors which has previously been produced and extrapolation of a new motion vector based on the extracted dominant vector. This is wholly unlike the present claimed invention which recites a “method of movement estimation for a sequence of images” that includes “a stage of reassignment of a vector to a block by selecting one movement vector from among N predominant vectors, wherein the predominant vectors are the ones of the group of vectors belonging to the movement vector field of said current image and at least to the movement vector field of a preceding image, the vectors being scaled according to the temporal distance to which they correspond”.

In view of the above remarks, applicants respectfully submit that there is no 35 USC 112, enabling disclosure in Kerdranvrat or Lee the would render the present invention as claimed in claim 1 unpatentable. As claims 2 – 13 are dependent on independent claim 1, it is respectfully submitted that claims 2 – 13 are patentable for the same reasons as discussed above with respect to claim 1. Thus, it is further respectfully submitted that this rejection has been satisfied and should be withdrawn.

Having fully addressed the Examiner's rejections, it is believed that, in view of the preceding amendments and remarks, this application stands in condition for allowance. Accordingly then, reconsideration and allowance are respectfully solicited. If, however, the Examiner is of the opinion that such action cannot be taken, the Examiner is invited to contact the applicants' attorney at the phone number below, so that a mutually convenient date and time for a telephonic interview may be scheduled.